

REMARKS

Applicants acknowledge receipt of a Final Office Action dated July 17, 2007. In this response, Applicants have amended claims 1 and 8 and have added claims 9-11. Support for these amendments may be found, *inter alia*, in the exemplary discussion on pages 8-10 of the specification. Applicants recognize that the outstanding rejection has been made final but respectfully request entry of the foregoing amendments since they place the claims in *prima facie* allowable form. Following entry of these amendments, claims 1-11 are pending in the application.

Applicants respectfully request reconsideration of the present application in view of the foregoing amendments and in view of the reasons that follow.

Rejection Under 35 U.S.C. § 103

On page 2 of the Office Action, the PTO has rejected claims 1-6 and 8 under 35 U.S.C. § 103(a) as allegedly being unpatentable over JP 2003-115314 to Akahori (hereafter “Akahori”) in view of U.S. Patent Application Publication 2002/0094467 to Nonobe *et al.* (hereafter “Nonobe”). In addition, on page 7 of the Office Action, the PTO has rejected claim 7 under 35 U.S.C. § 103(a) as allegedly being unpatentable over Akahori in view of Nonobe and further in view of U.S. Patent 6,960,401 to Barton *et al.* (hereafter “Barton”). Applicants traverse these rejections for the reasons set forth below.

In order to establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, prior art references must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in Applicants’ disclosure. *In re Vaeck*, 947 F.2d 488, 20 U.S.P.Q.2d 1438 (Fed. Cir. 1991).

Here, Akahori, Nonobe, and Barton, whether taken individually or in combination, fail to teach or suggest a fuel cell system “wherein the controller is configured to determine whether to increase the flow rate of the gas in the circulation flow path or to open the valve

based on the voltage measured by the voltage sensor” as recited in independent claim 1. Furthermore, Applicants submit that Akahori, Nonobe, and Barton, whether taken individually or in combination, fail to teach or suggest a method for improving fuel gas consumption in power generation of fuel cells comprising “determining whether to increase the flow rate of the fuel gas in the fuel gas circulation system or to open the valve based on the monitored output voltages” and “opening the valve to discharge the fuel gas out of the fuel gas circulation system, if some of the monitored output voltages are within the predetermined range and the average value of the output voltages of the respective fuel cells is lower than a predetermined value” as recited in independent claim 8. For at least this reason, Applicants submit that the outstanding rejections based upon combinations of Akahori, Nonobe, and Barton are improper and ought to be withdrawn.

With particular regard to Akahori, Applicants note that the purge valve (206) is controlled to be opened for a predetermined time (t_2) if there is any cell having a decreasing voltage. When the flow rate of the hydrogen gas is small, even if the purging operation is performed, the effectiveness of the purging is not sufficient because the flow rate of the gas is small. Therefore, the predetermined time (t_2) is set to be longer as the flow rate of the hydrogen gas becomes smaller ([0032]-[0039]). Akahori does not teach or suggest the presently claimed controller (which “is configured to determine whether to increase the flow rate of the gas in the circulation flow path or to open the valve based on the voltage measured by the voltage sensor”) or pump (which is a “a variable flow rate circulation pump for circulating the gas through the circulation flow path, which is operative to adjust a flow rate of the gas in the circulation flow path”).

In Nonobe, the shut-off valve (414) is periodically opened to discharge hydrogen gas containing the impurities or the moisture leaking from the oxygen electrode side (see, [0053]). When the shut-off valve (414) is opened, rapid flow of the hydrogen gas takes place due to a difference between the pressure in the hydrogen-gas flow system and the atmospheric pressure, and the moisture is blown off utilizing the stream of the hydrogen gas (see, [0054]). This opening of the valve (414) is performed on a periodic basis, and is not based on the output voltage of the unit cells of the fuel cell (100).

Further, in Nonobe, the hydrogen off-gas is circulated through the circulation passage (401) by the pump (410), however this is in order to supply hydrogen to the fuel cell (100)

(see, [0044]), and to have the impurities be uniformly distributed over the entire length of the hydrogen-gas passage to thereby prevent the reduction in output voltage of the fuel cell (100) (see, [0045]). The pump (410) is controlled so that the flow rate or speed of the hydrogen gas varies depending on an amount of consumption of the electric power generated by the fuel cell (100) (see, [0046]). Such pump control merely supplies hydrogen gas to the fuel cell in an amount required to compensate for the consumed electric power, and does not increase the flow rate of the hydrogen-gas based on the output voltage of the unit cells of the fuel cell (100) nor to solve a clogging problem. Thus, Nonobe fails to add anything to resolve the fundamental deficiencies of Akahori, namely the failure to teach or suggest the presently claimed combination of a controller (which “is configured to determine whether to increase the flow rate of the gas in the circulation flow path or to open the valve based on the voltage measured by the voltage sensor”) and pump (which is a “a variable flow rate circulation pump for circulating the gas through the circulation flow path, which is operative to adjust a flow rate of the gas in the circulation flow path”).

Barton adds nothing to resolve the deficiencies in Akahori and Nonobe.

If an independent claim is nonobvious under § 103, then any claim depending therefrom is nonobvious. *In re Fine*, 5 USPQ2d 1596 (Fed. Cir. 1988). See MPEP 2143.03. Thus, Applicants submit that claims 2-7, each of which ultimately depends from independent claim 1, are also non-obvious at least by virtue of their dependency from independent claim 1.

In view of the foregoing, Applicants respectfully request reconsideration and withdrawal of the outstanding rejection under § 103.

Newly Added Claims

In this response, Applicants have added claims 9-11.

With regard to claim 9, Applicants submit that none of the cited references, namely Akahori, Nonobe, and Barton, whether taken individually or in combination, teach or properly suggest a fuel cell system “wherein the fuel cell comprises a plurality of cells stacked on one another, and the voltage sensor measures voltages of the respective cells, and wherein the controller is configured to control the circulation pump to increase the flow rate of the gas in the circulation flow path if some of the measured voltages are below a predetermined range which includes an average value of the measured voltages of the respective cells, and to open

the valve if some of the measured voltages are within the predetermined range and the average value of the voltages of the respective cells is lower than a predetermined value.”

With regard to claim 10, Applicants submit that none of the cited references, namely Akahori, Nonobe, and Barton, whether taken individually or in combination, teach or properly suggest a fuel cell system “wherein the controller is configured to control the circulation pump to *decrease* the flow rate of the gas in the circulation flow path when the valve is being opened.” (Emphasis added).

With regard to claim 11, Applicants submit that none of the cited references, namely Akahori, Nonobe, and Barton, whether taken individually or in combination, teach or properly suggest a fuel cell system “wherein the controller is configured to control the circulation pump to increase the flow rate of the gas in the circulation flow path if the voltage measured by the voltage sensor becomes lower than a predetermined value, and to open the valve thereafter if the voltage measured by the voltage sensor does not recover to the predetermined value.” By virtue of this feature, the claimed system can avoid clogging of gas passages in the fuel cell by increasing the flow rate of the gas in the circulation flow path, while reducing the frequency or duration of the fuel gas discharge through the valve.

CONCLUSION


Applicants believe that the present application is now in condition for allowance. Favorable reconsideration of the application as amended is respectfully requested.

The Examiner is invited to contact the undersigned by telephone if it is felt that a telephone interview would advance the prosecution of the present application.

The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 19-0741. Should no proper payment be enclosed herewith, as by a check or credit card payment form being in the wrong amount, unsigned, post-dated, otherwise improper or informal or even entirely missing, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 19-0741. If any extensions of time are needed for timely acceptance of papers submitted herewith, Applicant hereby petitions for such extension under 37 C.F.R. § 1.136 and authorizes payment of any such extensions fees to Deposit Account No. 19-0741.

Respectfully submitted,

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